

REMARKS

Reconsideration of the present application is respectfully requested.

The examiner has not initialed one of the references (USP 4,962,340) listed on the form PTO-1449 that was submitted along with an IDS at the time of filing of the present application. Therefore, Applicant is submitting a request for return of initialed form PTO-1449 along with a copy of the originally submitted form PTO-1449.

Claims 1-9 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Morishita (USP4,931,633; hereinafter referred to as Morishita '633) in view of Morishita (USP4,902,905; hereinafter referred to as Morishita '905). In response, Applicant has amended independent claims 1 and 7. Support for the amendments to claims 1 and 7 may be found in, for example, FIGS. 2, 4, 6 and 7, and at page 8, lines 18-26 in the originally filed specification.

Amended claim 1 recites that the restricting member (12) is normally in press-contact with the front end surface (6b) of the pinion (6) thereby to press the rear end surface (6a) of the pinion (6) to the step (5b) of the pinion shaft (5). The restricting member (12) is located in front of the pinion (6) and presses the pinion (6) in the direction of the motor (2) such that the rear end surface (6a) of the pinion (6) is in press contact with a step (5a) of the pinion shaft (5) normally. For example, as shown in FIG. 2, the restricting member (12) is formed with a tapered surface (12b) to press the pinion (6) to the step (5b) of the pinion shaft (5). Therefore, the pinion (6) is normally fixed on the pinion shaft (5) regardless of the movement of the pinion shaft (5), and therefore restricts axial movement and vibration of the pinion (6) with respect to the pinion shaft (5).

Amended claim 7 recites that a pressing member (15, 16) is disposed between the pinion (6) and the pinion shaft (5) on a side of the rear end surface (6a) of the pinion (6) for pressing the pinion (6) toward the restricting member (12) relative to the pinion shaft (5). The rear end surface (6a) of the pinion (6) faces the step (5b). Therefore, when a force in an axially backward direction is applied to the pinion (6), such as when the pinion meshes with a ring gear (not shown), the rear end surface (6a) is brought in contact with the step (5b) and the pressing member (15, 16) can absorb shock or stress when the pinion (6) meshes with the ring gear. Therefore, the meshing of the pinion (6) with the ring gear is improved and durability of the pinion (6) and the ring gear is improved.

The above claimed invention is applicable for a starter including the pinion (6) and the pinion shaft (5), both of which are engageable with each other, although they are normally disengaged from each other. Since the pinion (6) is normally pressed in the axially forward direction or axially backward direction, no clearance remains between the restricting member (12) and the pinion (6). Therefore, the vibration of the pinion (6) and abrasion otherwise due to the vibration of the pinion (6) is minimized.

Morishita '633 discloses pinion stopper arrangement for a starter motor that, as the Examiner mentioned in the Office Action in page 2, does not disclose a restricting member in press contact with a front end surface of a pinion thereby to press a rear end surface of the pinion to a step of the pinion shaft.

According to the Examiner, Morishita '905 allegedly discloses a stopper ring 47 for preventing an over-running clutch 22 from moving forward on an output shaft 21. As shown in FIG. 12, when the over-running clutch 22 is inserted onto the output shaft 21, the stopper ring 47 is forcedly expanded to increase its inner diameter so that the stopper ring 47 can pass over a

circumferential projection 36 of the output shaft 21. Once the stopper ring 47 has passed over, it returns to its original diametrical shape. Therefore, the over-running clutch 22 is prevented from moving forward on the output shaft 21. This is explained on column 3, line 65 to column 4, line 19, albeit specifically with respect to an assembly of a first embodiment shown in FIG. 6. Incidentally, the stopper ring 47 has a tapered (beveled) surface 47a. However, the tapered surface 47a is not for pressing the pinion 24 but for providing necessary flexibility for enabling the stopper ring 47 to expand easily over the circumferential projection 36.

In Morishita '905, the stopper ring 47 is located between the circumferential projection 36 and a motor (armature) 2 when the over-running clutch 22 and the pinion 24 are in a stationary position. In this condition, the stopper ring 47 is separated from the circumferential projection 36. When the output shaft 21 is driven and a shift lever 10 pushes the over-running clutch 22, the over-running clutch 22 and the pinion 24 move in a forward direction of the output shaft 21. Thus, if the over-running clutch 22 and the pinion 24 excessively move in a forward direction of the output shaft 21, the stopper ring 47 finally touches the circumferential projection 36 to prevent the over-running clutch 22 and the pinion 24 from further moving in a forward direction of the output shaft 21 (Fig. 11). Accordingly, the stopper ring 47 does not normally touch the circumferential projection 36 and is not for fixing the pinion 24. Therefore, the stopper ring 47 does not minimize vibration of the pinion and abrasion due to the vibration of the pinion.

Further, Morishita '633 and Morishita '905 only disclose a starter including a pinion that is integral with a pinion shaft, as opposed to the separate pinion and pinion shaft of the present invention. Therefore, even assuming arguendo that there is motivation to combine the two Morishita references, the resulting combination still would not render the presently claimed

invention obvious, as the combination would not address the issue of vibration and abrasion due to the vibration of the pinion.

Accordingly, the cited Morishita references do not teach or suggest a restricting member normally in press-contact with a front end surface of a pinion thereby to press a rear end surface of the pinion to a step of a pinion shaft, as recited in claim 1. Also, all references do not teach or suggest that the pressing member disposed between the pinion and the pinion shaft on a side of the rear end surface of the pinion for pressing the pinion toward the restricting member relative to the pinion shaft, as recited in claim 7. Therefore, it is respectfully requested that the Examiner's rejection of claims 1 and 7 be withdrawn. Further, as claims 2-6 and 8-9 depend from amended claims 1 and 7 respectively, they are allowable for the same reasons as amended claims 1 and 7.

New claims 10-13 are patentable for the reasons given for the claim 7 and new claim 14 is also patentable for the reasons given for the claim 1 from which it depends. More specifically, claim 10 recites the patentable pinion shaft configuration in the starter of the present invention with out reciting the starting motor itself. Support for claims 10-13 may be found on page 10, line 16 to page 11, line 13, page 12, lines 7-12 and FIG. 7 and 8. Support for claim 14 may be found, for example, on page 7, lines 7-14 and FIG. 2.

In view of the above amendments and remarks, the present application is now believed to be in condition for allowance. A prompt notice to that effect is respectfully requested.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'DGP', written over a horizontal line.

David G. Posz
Reg. No. 37,701

Law Offices of David G. Posz
2000 L Street, NW
Suite 200
Washington, DC 20036
(202) 416-1638
Customer No. 23400

MARKED UP VERSION OF AMENDED SPECIFICATION AND CLAIMS

IN THE SPECIFICATION

Please change the paragraph beginning at page 1, line 11 as follows:

In a conventional starter disclosed in JP-A-2000-9003, a pinion shaft is integrated with an inner surface of a one-way clutch and a pinion is fitted to the pinion shaft in a rotation-restricted manner. The pinion shaft is integrally pushed forward with the pinion by using an attracting force (pull-in force for pulling a plunger) of a magnet switch. As shown in FIG. 9, a clip 100 is fitted in a circumferential recess 120 provided on the pinion shaft 110 to restrict the pinion from moving in an axial direction.

Please change the paragraph beginning at page 3, line 9 as follows:

Further, a pressing member is provided between the pinion and the pinion shaft at the rear side of the pinion to press the pinion against the detent ring with respect to the pinion shaft. Thus, the vibrations of the pinion against the pinion shaft [is] are suppressed.

Please change the paragraph beginning at page 6, line 5 as follows:

As shown in FIG. 2, the pinion 6 is combined with the front end portion of the pinion [shat] shaft 5 through splines 5a. At a front end of the cylindrical portion of the pinion shaft 5, a step is provided for receiving the pinion 6 as a thrust receiving wall 5b. A rear end surface 6a of the pinion 6 is in press-contact with a thrust receiving wall 5b so that an axially backward movement of the pinion 6 is restricted, while an axially forward

movement of the pinion 6 is restricted by the detent ring 12 fitted in the circumferential recess 13 of the pinion shaft 5.

Please change the paragraph beginning at page 8, line 7 as follows:

After the engine is started by the rotation of the ring gear, when the key switch is turned off, [en] an electric current to the winding 3b is shut off so that the pull-in force of the magnet switch 3 extinguishes. Therefore, the plunger 3a returns to a stationary position (position in FIG. 1). At this time, a power returning the plunger 3a to the stationary position is transmitted to the one-way clutch 7 through the lever 8. Then, the pinion shaft 5 is integrally pulled back along the output shaft 4 with the one-way clutch 7 (in the right direction in FIG. 1). The pinion 6 moves away from the ring gear and returns to the stationary position. Further, due to disconnection of the inner contact in the magnet switch 3, the electric current to the armature is shut off to stop armature rotation.

IN THE CLAIMS

Please amend claims 1 and 7 as follows.

1. (Amended) A starter comprising:

a starting motor for generating rotation force;

a pinion shaft rotatable by the starting motor and supported slidably in an axial direction, the pinion shaft having a recess and a step on an outer periphery thereof;

a pinion fitted on an end of the pinion shaft opposite to the starting motor in a rotation-restricted manner relative to the pinion shaft and movable forward integrally

with the pinion shaft, the pinion having a front end surface and a rear end surface, the front end surface being opposite to the rear end surface and the rear end surface being on a motor side; and

a restricting member fitted in the recess in contact with the pinion,

wherein the restricting member is normally in press-contact with the front end surface of the pinion thereby to press the rear end surface of the pinion to the step of the pinion shaft so that the pinion is restricted from moving in an axially forward direction and an axially backward direction relative to the pinion shaft.

7. (Amended) A starter comprising:

a starting motor for generating rotation force;

a pinion shaft rotatable by the starting motor and supported slidably in an axial direction, the pinion shaft having a recess on an outer periphery of a front end portion thereof and a step on the outer periphery thereof;

a pinion fitted on the pinion shaft in a rotation-restricted manner relative to the pinion shaft and movable forward integrally with the pinion shaft, wherein the pinion [having] has a front end surface and a rear end surface, wherein the front end surface is further from the motor than the rear end surface and the rear end surface adjacently faces the step in the axial direction;

a restricting member fitted in the recess in front of the pinion in an axial direction to receive the front end surface of the pinion; and

a pressing member disposed between the pinion and the pinion shaft [at a rear side] on a side of the rear end surface of the pinion for pressing the pinion [against] toward the restricting member relative to the pinion shaft.],

wherein the rear end surface of the pinion adjacently faces the step in the axial direction.]